DOCUMENT RESUME

ED 250 352 TM 840 660

AUTHOR Ornstein, Peter A.; Naus, Mary J.
TITLE The Influence of the Knowledge Base on the Development of Mnemonic Strategies.
PUB DATE [Apr 84]
NOTE 10p.; Paper presented at the Annual Meeting of the American Educational Research Association (68th, New Orleans, LA, April 23-27, 1984).
PUB TYPE Speeches/Conference Papers (150) -- Viewpoints (120)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Age Differences; *Cognitive Development; Cognitive Structures; Developmental Stages; Knowledge Level; Learning Strategies; *Memory; *Mnemonics; Performance Factors; *Prior Learning; *Recall (Psychology); Stimulus Generalization; Transfer of Training
IDENTIFIERS Organizing Strategies; Rehearsal Strategies

ABSTRACT

A dominant theme in cognitive psychology is that prior knowledge in long-term memory has a strong influence on an individual's cognitive processing. Citing numerous memory studies with children, knowledge base effects are presented as part of a broader picture of memory development. Using the sort/recall procedure (asking subjects to group sets of items prior to recall), instructions provided have dramatic effects on the sorting style and recall performance of younger children. With highly salient stimulus materials (categorically related items) and remembering based instructions, third graders form meaningful groups and transfer the organizational strategy to unstructured materials. Rehearsal strategies of third graders also vary as a function of stimulus properties. The data suggest that with developmental advances in component cognitive skills, applying mnemonic strategies requires less effort and becomes increasingly routinized. Complete understanding of memory development requires a longitudinal analysis of children at all stages of mnemonic competence, rather than traditional cross-sectional research designs focusing on particular mnemonic skills. (BS)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED250352

The Influence of the Knowledge Base on the Development of Mnemonic Strategies

Peter A. Ornstein
University of North Carolina
at Chapel Hill

Mary J. Naus
University of Houston

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

X This document has been reproduced as received from the person or organization originating it.
Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

M.J. Naus

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

TM 840 660

A dominant theme in cognitive psychology is that "prior knowledge" in long-term memory has a strong influence on an individual's cognitive processing. In the area of memory, for example, there has been longstanding interest in the role that an individual's knowledge plays in governing the acquisition of new information. Within experimental psychology, this point of view has been most clearly identified with various types of constructivist and schema theories (including those of Bartlett and Piaget, as well as more current articulations of these positions). But it also has been seen in the work of verbal learning theorists, albeit in a rather different form. Ebbinghaus (1885), for example, attempted to eliminate the operation of prior knowledge about stimulus materials, so that the formation of associative bonds could be examined in isolation. Later psychologists in the verbal learning tradition attempted to demonstrate the effects of prior knowledge under the rubric of variables such as the meaningfulness and familiarity of verbal elements (see Kausler, 1974).

If knowledge effects can be shown in the recall of adults, how much more important must these be for an understanding of developmental changes in memory? With increases in age, there are profound changes in the contents and structure of the knowledge system, and these changes can exert a substantial influence on children's abilities to remember. Evidence for this position can be seen in the findings in the literature (e.g., Chi, 1978; Lindberg, 1980) that children's memory performance can exceed that of adults under conditions in which the children have more knowledge of the to-be-remembered materials than do the adults. Yet, despite a number of these demonstrations, we are far from understanding the mechanisms by which prior knowledge affects recall. Today we would like to explore one possible mediating link (certainly not the only one), that of memory

strategies. Mnemonic techniques such as rehearsal and organization have been shown to be central to an account of memory development in the elementary school years. We have learned recently, however, that strategic deployment is not context free, but rather varies as a function of a number of variables, one of which is children's understanding of the to-be-remembered materials. We find that children may appear to be facile users of mnemonic procedures with some types of materials, and relatively unstrategic with others.

These findings--some of which will be reported presently--lead us to the view that the knowledge base in permanent memory has a clear impact on the emergence of particular mnemonic skills and on the changes that may be observed in the "sophistication" of these skills. And, we even think that this knowledge system may provide a mechanism by which strategies are generalized from one setting to another. To put all of this together, we find it useful to talk in terms of a broad continuum of mnemonic competence that ranges from the first tentative application of mnemonic efforts in various highly salient and supportive contexts to the routine and efficient application of procedures in a broad array of situations.

Let us examine one of the context effects that has led us to this view of the influence of knowledge upon strategic deployment. Since Flavell's (e.g., 1970) pioneering research, we have known that children do not always use the mnemonic procedures of which they are capable. Demonstrations of these "production deficiencies" have typically involved prompting children to use one particular strategy or another. Thus, in our own work on organization (e.g., Liberty & Ornstein, 1973; Bjorklund, Ornstein, & Haig, 1977; Corsale & Ornstein, 1980), using the sort/recall procedure in which subjects are asked to group sets of items prior to an

attempt at recall, the particular instructions that we provide can have a dramatic effect on young children's performance. If we ask third and seventh graders to sort relatively unrelated items so that the groups formed will help them to remember, the sorting of the older children is rather semantically constrained, whereas that of the younger children seems to be essentially random. The seventh graders search for meaningful relations among the stimuli (even these relatively unstructured items), whereas the third graders do not appear to do this. However, it can be demonstrated that the young children do in fact have the knowledge that would permit them to sort in a manner similar to that of the older children. We can, for example, use a yoking procedure to require that the third graders learn sorting patterns of older individuals; this they can easily do, and recall facilitation is observed. And perhaps more importantly, we can get this same effect by simply telling the children to group on the basis of meaning. That is, by telling third graders to form groups of items that "go together" or are "similar in some way" as opposed to groups that will "help you remember," we can observe a major change in sorting style and recall performance.

But there is more to the story. Without changing the basic instruction to form groups that will facilitate remembering, it turns out that the third graders will sort in an organized fashion with some sets of stimulus materials. For example, Corsale (1978), in dissertation work carried out in our laboratory, has shown that when sets of categorically related items are substituted for the more-or-less unrelated materials that were used previously, third graders will spontaneously sort in a meaning-based fashion when told to form groups that will aid in remembering. Thus, with highly salient stimulus materials, young children behave in a "strategic"

fashion, interpreting instructions to form groups that will facilitate remembering as a prompt to sort in an organized fashion, whereas with unrelated materials they do not seem to exploit this underlying knowledge in the service of a memory goal. We have some confidence in this finding because it has been replicated and extended (Best & Ornstein, in preparation). Not only will third graders form meaningful groups given remembering-based instructions and highly salient stimulus materials, but they seem to induce an organizational strategy that they can transfer to sets of unstructured materials. Thus, exposure to sets of related materials resulted in the transfer of a meaning-based strategy when confronted with low associated materials. In addition, compared to the appropriate control condition, these subjects showed elevated levels of recall and enhanced understanding of the importance of grouping according to meaning as an aid to memory.

We can also demonstrate that the rehearsal strategies of children in the early elementary school years may vary as a function of stimulus properties. As an example of such a knowledge base effect in rehearsal, consider a study carried out with Barbara Tarkin and Nancy Myers. Third graders rehearsed aloud while being presented with one of two lists. All words were known to the children, but the lists differed in meaningfulness, in the verbal learning sense of the term. Thus, some children rehearsed and recalled high meaningful items, that is, words that elicited many associations, whereas others were given words that were low in meaningfulness. The data indicated marked differences in spontaneous rehearsal. The low meaningfulness group rehearsed fewer than two different items at each opportunity for rehearsal, whereas the high meaningfulness group typically rehearsed more than three items together. This value is characteristic of that of sixth graders who have been studied in our laboratory. Corresponding

differences were observed in recall performance.

We now have several demonstrations of this kind, all suggesting that children's attempts at strategies for memorization may vary as a function of the characteristics of the to-be-remembered material. In each instance, more "sophisticated" efforts are observed with stimuli whose organizational properties are rather salient. These outcomes suggest to us that observed strategies are to some extent stimulus-driven. Thus, in the sort/recall studies, there may be a type of obligatory semantic encoding at work, an encoding that is forced to some extent by the strong associative links among the items. These interconnections must be so salient that young children can do little to prevent organized sorting according to meaning when presented with stimuli. And, with the rehearsal data, it seems quite likely that the more active strategies that are observed with the high meaningful items reflect an associative activation of the knowledge base. A type of associative priming may make it easier for subjects to retrieve high meaningful items from early list positions to include in an active fashion with later list items. Further, if it is assumed that the words typically used in experiments on memory may be functionally more meaningful for older children than for younger children, a potential mechanism underlying the developing tendency for active rehearsal may be identified.

These demonstrations and the tentative interpretations that we have placed on them suggest that it may be difficult indeed to distinguish between automatic and deliberate aspects of strategy deployment. In both the rehearsal and organizational strategies, we observe what would seem to be automatic mediation by the child's preexisting knowledge system. This claim, of course, is reminiscent of Lange's (1973, 1978) arguments concerning category clustering. Lange suggested that early demonstrations

of category clustering in the recall of preadolescent children may be more an automatic consequence of strong stimulus interconnections than the deliberate deployment of a strategy in the service of a memory goal. Our demonstrations differ from Lange's in that our rehearsal and organizational effects are by definition observed at the input as opposed to the output side of the study/recall sequence. They thus seem to us to involve clear efforts at deliberate involvement in the task of remembering, but these deliberate efforts certainly seem to be influenced by automatic activation of the knowledge system.

The knowledge base effects that we have presented appear to be part of a broader picture of memory development. As suggested above, it seems likely that children's first successful attempts at deliberate remembering come about in salient, supportive contexts. When the task is that of comitting highly associated stimuli to memory, children would seem to be supported in their efforts by certain characteristics of the items, more so than would be the case when they are given stimuli that lack strong interitem connections. Although firm data are lacking, we would suspect that after success in remembering highly structured materials, children are able to transfer their strategic approach to other types of materials that are less supportive. The study of the transfer of organized sorting from highly organized to unrelated materials (Best & Ornstein, in preparation) that was discussed above suggests such a sequence in children's acquisition of deliberate memory skills. We do, however, freely admit that longitudinal data are necessary to support this claim.

Moving beyond the progression from highly salient to less supportive contexts, we find that there are many changes in mnemonic skill implementation that have been largely ignored by developmental psychologists (Ornstein

& Baker-Ward, 1983). With increases in age, children clearly become more effective in strategy deployment, in part because they become more facile in the execution of some of the component parts of the strategies. Thus, for example, consider an active rehearsal strategy and the fact that success with this technique demands being able to retrieve previously presented items to include in current rehearsal. Clearly, as suggested above, this process may be facilitated by age-related associative changes in the knowledge base. But, more generally, there may be a developmental progression in retrieval ability that brings about increasingly active efforts at remembering. Indeed, our data (Ornstein, Medlin, Stone, & Naus, in preparation) indicate that when the retrieval demands of the task are minimized, second graders can execute an active rehearsal strategy quite effectively. The data suggest that with developmental advances in component skills such as retrieval, the application of mnemonic strategies requires less effort and becomes increasingly routinized or automatic. In fact, using a dual task paradigm, Guttentag (1984) has recently reported data that indicate that the effort requirements of an active rehearsal technique are much greater for younger children than for older children. Thus the execution of the strategy requires less allocation of attention for older children than is the case with younger children. Clearly, these findings are consistent with those accounts of cognitive development (e.g., Case, 1978) in which the routinization of skill is stressed.

To summarize all of this, we feel that memory skill progresses along a broad continuum. We suspect that the child moves from success in highly salient situations to the efficient use of a variety of memory skills in many different settings in which memorization is required. With practice

in tasks that require memory, with the articulation of the knowledge system, and with the development of supporting cognitive skills, children become increasingly efficient in the implementation of mnemonic skills. It is clear that this perspective implies that a complete understanding of the development of memory requires a longitudinal analysis of children at all stages of mnemonic competence. We need to move away from traditional cross-sectional research designs in which we focus on particular mnemonic skills (such as the rehearsal and organizational techniques that we have been discussing today) to longitudinal designs that involve the assessment of children on a wide range of memory skills in a variety of different contexts. Only in this manner will we be able to truly hope to understand the emergence and development of skilled remembering.